



### D26 Forensic Microscopy in Determining Historical 1960s and 1970s Asbestos Exposures to Cutting Asbestos/Cement (A/C) Pipe

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After attending this presentation, attendees will better understand how Polarized Light Microscopy (PLM), Phase Contrast Microscopy (PCM), and Transmission Electron Microscopy (TEM) were used to determine information regarding the historical asbestos exposure to a worker cutting A/C pipe in the days before proper protection procedures were mandated.

This presentation will impact the forensic science community by providing information to assist in the investigation of asbestos exposures that occurred before exposure monitoring was conducted and where few records exist.

Since the 1920s, A/C pipe has been manufactured from a mixture of asbestos, standard Portland cement, and silica sand. Millions of miles of A/C pipe have been sold around the world to carry drinking water, sewage, telephone duct, and cable conduit. Although not officially banned, A/C pipe is generally not currently used in the United States because of the potential release of asbestos fibers, which are a known carcinogen when inhaled. In the 1960s and 1970s, A/C pipe was cut in the field with a variety of tools, including power saws and abrasive disc cutters. Historical asbestos air sampling data during the cutting of A/C pipe is limited.

To provide more information about the historical asbestos air levels during cutting, a study for possible fiber release was conducted involving the cutting of a piece of A/C pipe in a controlled area while air samples were collected. PLM analysis revealed the pipe contained 20% chrysotile and 2% crocidolite. Air samples were collected in the breathing zone (seven feet distant) of a worker using a gas-powered pipe cutter with a new 14-inch diamond blade. These air samples were collected by a worker with pipe-cutting experience.

The study was conducted in a test chamber that was approximately 9ft high by 10ft wide by 12ft long. The study area had a High Efficiency Particulate Absolute (HEPA) air filtration device that was used to clean the area of particulates before testing activities. The HEPA unit ran at a rate of 177cfm during the testing. While inside the study area, the worker was protected by an air-line supply respirator and complete head and body coverings. The chamber and airline supply intake were monitored for levels of carbon monoxide.

Prior to the testing, an air sample was collected within the chamber. It was apparent that the gas-powered cutter (saw) had been used to cut cement previously. Testing was performed to determine whether the cement residue in the cutter contained any asbestos. An air sample was collected next to the power saw cutter while the cutter was turned on, run briefly, and turned off, and while it was being cleaned and blown out with compressed air at intervals over a one-hour period.

The asbestos level in the breathing zone of the worker during the cutting interval was 182 fibers/cc (PCM National Institute for Occupational Safety and Health (NIOSH) 7,400 value times TEM NIOSH 7,402 percent asbestos). The area sample (seven feet away) during cutting demonstrated a level of 159 fibers/cc. No asbestos fibers were detected in the blank samples or in the sample collected in the chamber before the testing began. No asbestos was detected in the cement residue material contained within the cutter when received. No asbestos was detected in the air when the cutter was running and while compressed air was blown into the cutter in pre-experiment cleaning.

Although the carbon monoxide monitor alarm did go off inside the chamber during the test, the carbon monoxide monitor outside the chamber near the supply air intake did not register above zero during the testing.

The high level of asbestos in the breathing zone of the worker cutting A/C pipe in this study are similar to a level of 170 fibers/cc published in a study of workers cutting A/C pipe in a trench in Japan. Other unpublished studies have also reported air samples more than 100 fibers/cc for cutting A/C pipe with power tools.

#### **Microscopy, Asbestos, Exposure Evaluation**